

# Google Application Engine



## Introduction

Charles Severance



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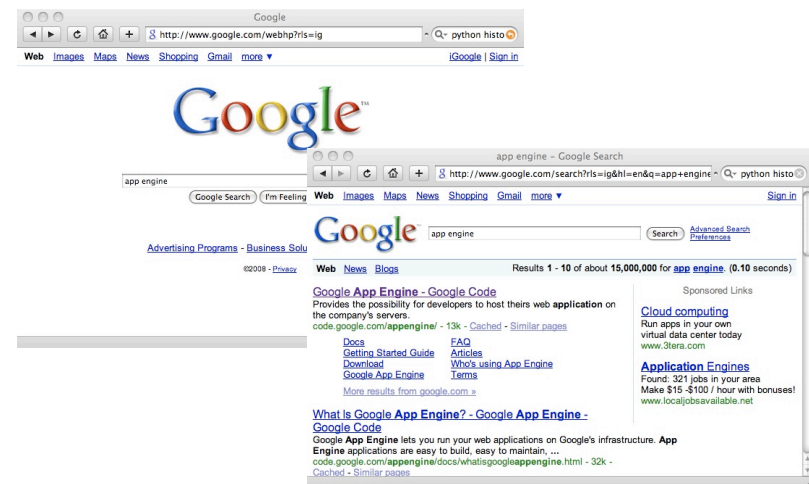
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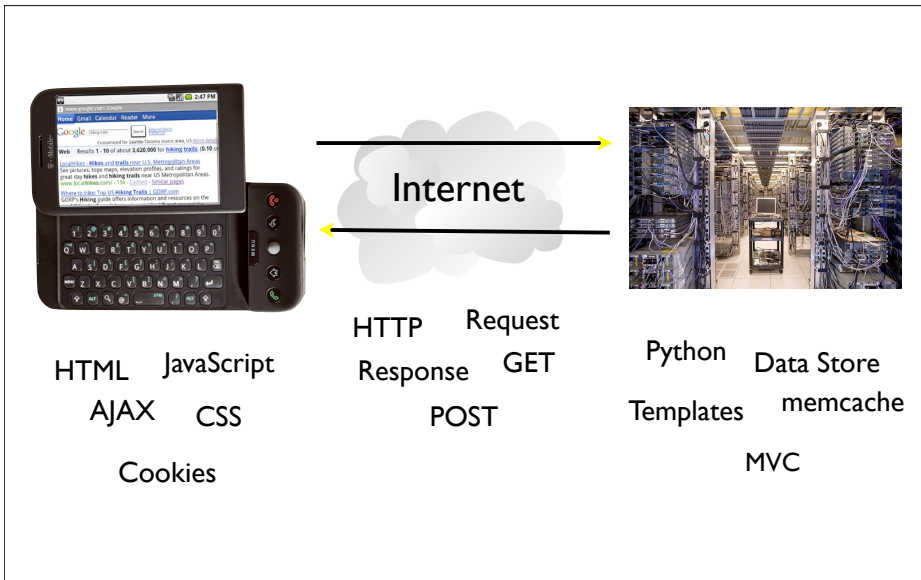
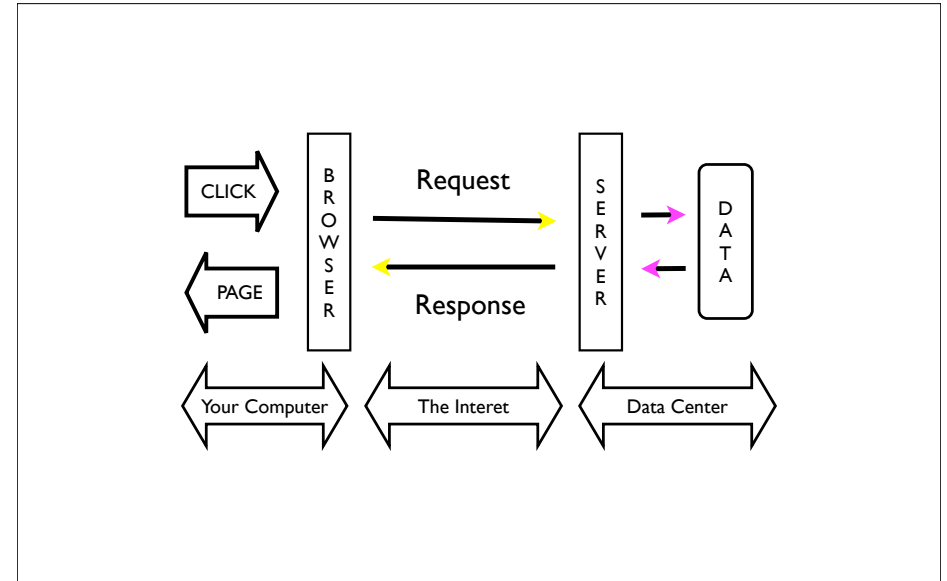
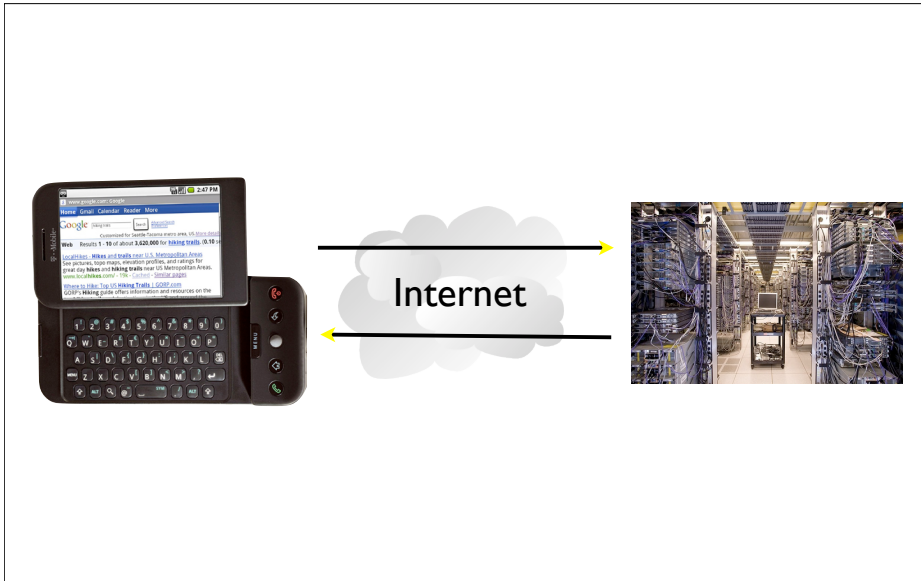
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# Web Applications

<http://en.wikipedia.org/wiki/HTTP>

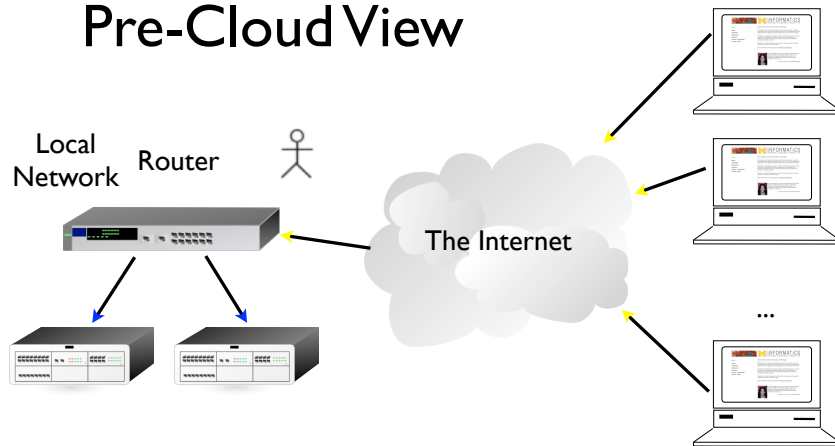




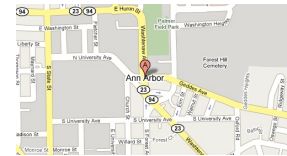
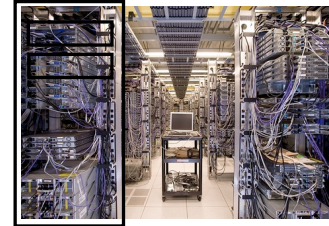
# Cloud Computing

[http://en.wikipedia.org/wiki/Cloud\\_computing](http://en.wikipedia.org/wiki/Cloud_computing)

## Pre-Cloud View



ctools.umich.edu



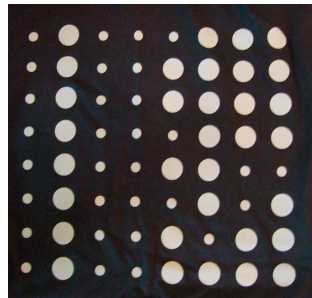
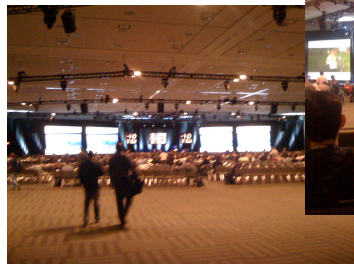
Hardware

Software



In a pre-cloud view servers have a geographic location and we use the Internet to exchange data with those servers.

## Google I/O 2008



## Google I/O 2008 Keynote

- Google I/O '08 Keynote by Marissa Mayer
- Usability / User Experience / User Testing / Architecture / Philosophy



<http://www.youtube.com/watch?v=6x0cAzQ7PVs>



<http://www.youtube.com/watch?v=6x0cAzQ7PVs>

## Lessons

- The cloud is wide - we can touch 1000 servers in 0.1 seconds
- For things that seem “intelligent” 0.2 seconds is fast enough - as long as you can do a lot of them
- Lots of spread-out storage and a fast scan is important
- Data - Information - Knowledge - starts with data and the ability to look through that data quickly



## Scalable Infrastructure

<http://www.youtube.com/watch?v=zRwPSFpLX8I>

## Infrastructure

- The only sustainable scalability is when you scale with inexpensive, green solutions
- Tape Backup is a rate limiting factor - so we need something creative
- Disaster recovery - “Of course!”

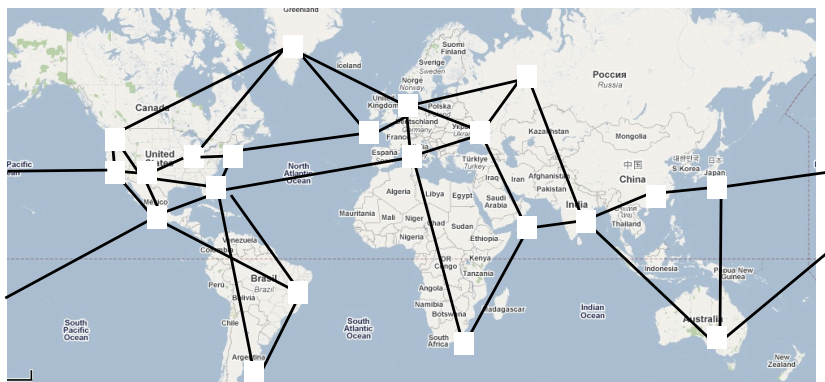
# World-Scale Applications

- For world-scale applications - the servers must be distributed around the world
- But users must see a uniform “single image” - [www.google.com](http://www.google.com)
- Also the programmers cannot know the structure or geography of the servers - because this always changes

# Google Server Locations



<http://royal.pingdom.com/2008/04/11/map-of-all-google-data-center-locations/>



# Programming in the Cloud

- Programmers operate in a controlled environment
- Programs do their programming thing - code + data
- A complex software framework manages getting the right code and data to/from the right servers.
- Software developers are unaware of geography

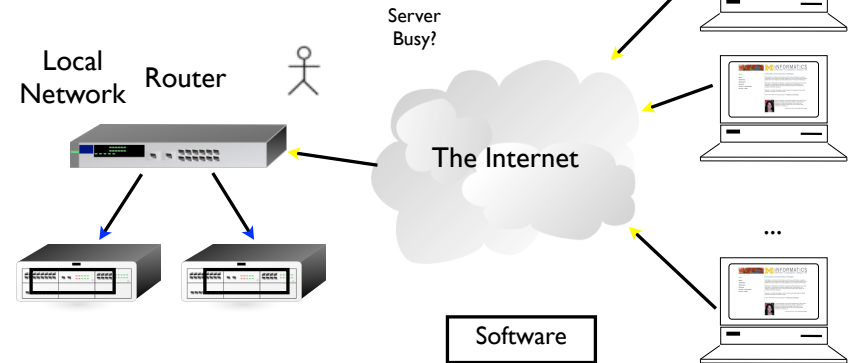


The geographic location no longer matters - the software "runs" somewhere in the cloud.

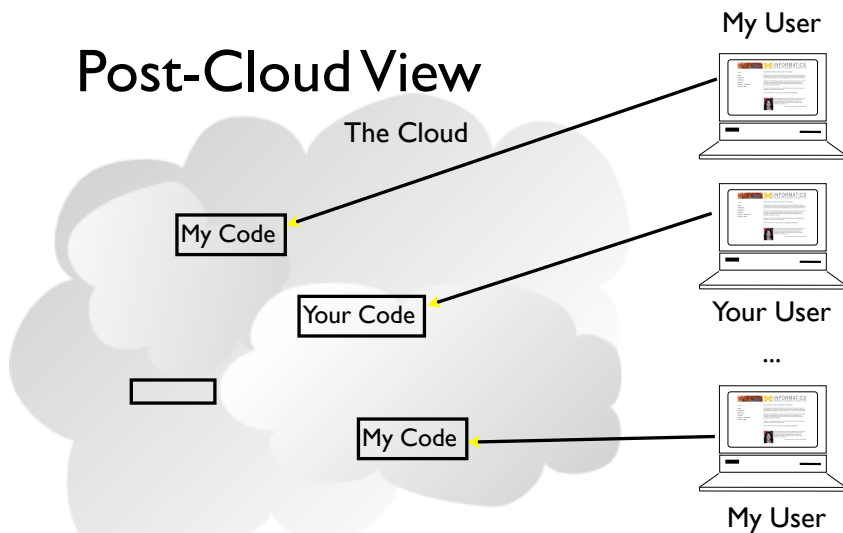


Resources can be dynamically adjusted as load changes.

## Pre-Cloud View



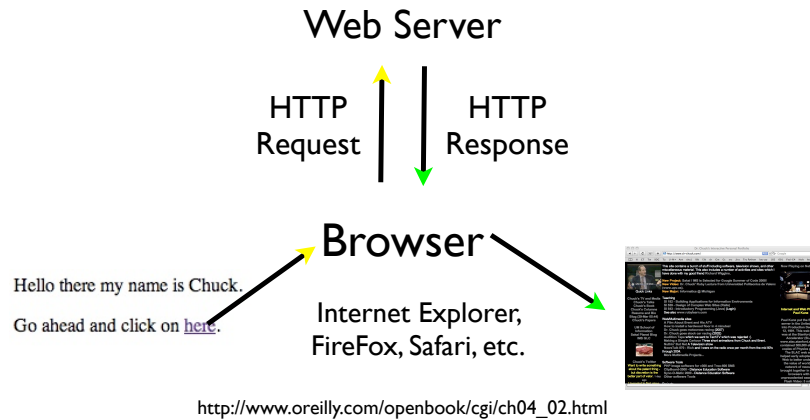
## Post-Cloud View



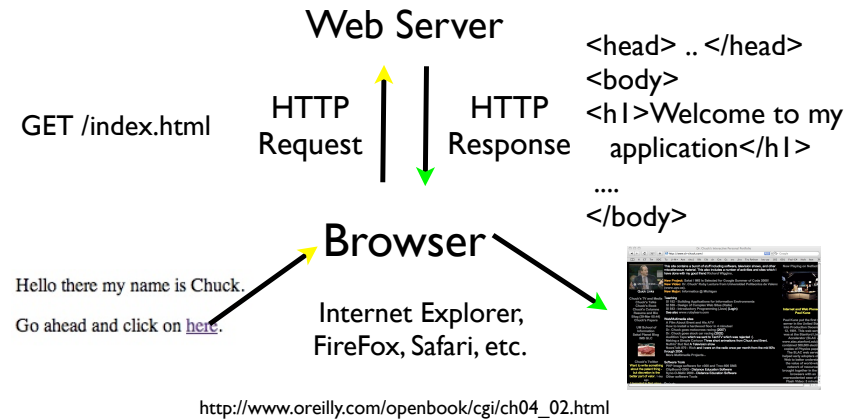
## HTTP - Request / Response

- The nature of the HTTP Request/Response cycle makes the cloud possible
- Since clients are not connected for very long - the cloud can be changed in between requests
- As long as the cloud "fakes" everything about the protocol - no one is the wiser..
- The cloud engineers at Google/Amazon/Yahoo are pretty clever.

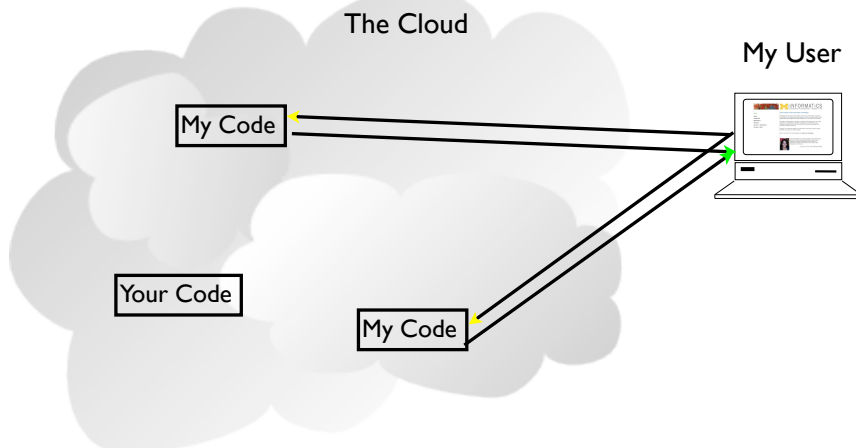
## HTTP Request / Response Cycle



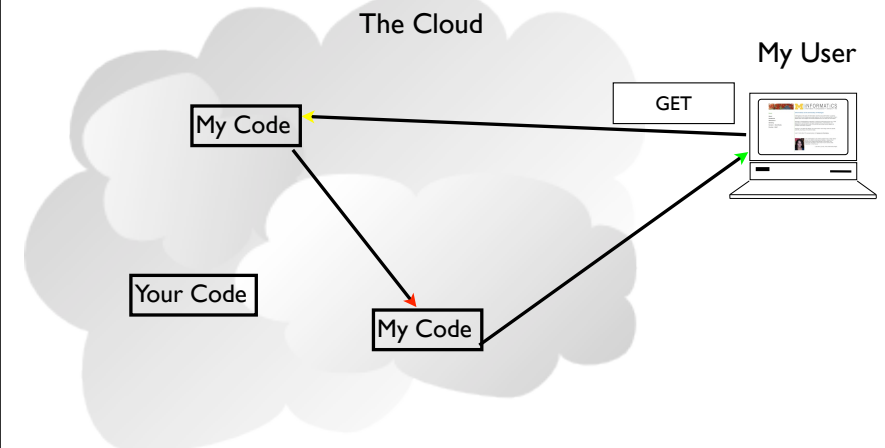
## HTTP Request / Response Cycle



## Post-Cloud View



## Post-Cloud View



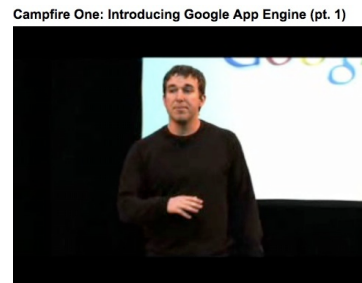
# Cloud Summary

- The cloud is the Internet plus computing that is “embedded” “inside” the network
- Companies like Google, Amazon, and Yahoo put servers all over the world
- Software runs on whichever server is most appropriate and data/code is moved around and the cloud can be reconfigured dynamically

# Google App Engine

# Google App Engine

- Expose Google’s worldwide Infrastructure to us as developers



<http://www.youtube.com/watch?v=3Ztr-HhWXIc>  
<http://www.youtube.com/watch?v=oTFL7FPLnXY>

5:20

# Google App Engine

- When you write a Google Application Engine Application - you are running in the Google Cloud
- Just like you were a Google Developer
- You don’t know where you are running or if one copy of a thousand copies of you are running
- Google hosts small applications for \*free\* - larger applications pay by usage



## Free Accounts

- A free account can use up to 500MB of persistent storage and enough CPU and bandwidth for about 5 million page views a month.

Quota	Limit
Apps per Developer	10
Storage per App	500MB
Files per App	1,000
Size per File	1MB

Quota	Limit
Emails per Day	2,000
Bandwidth In per Day	10,000 MB
Bandwidth Out per Day	10,000 MB
CPU Megacycles per Day	200,000,000
HTTP Requests per Day	650,000
Datastore API Calls per Day	2,500,000
URLFetch API Calls per Day	160,000

## Why is App Engine Free?

- Make the web better
- Be the first widely used “cloud” environment - beat Amazon, Microsoft, and Yahoo!

## Summary

- We introduced Cloud Computing - servers move “into” the network cloud
- Google App Engine allows us to use the Google Cloud for free
- To make use of this resource we need to “learn the rules of the road”